

TWO APPROPRIATION BUDGET/MISSION SUPPORT

FISCAL YEAR 2002 ESTIMATES

BUDGET SUMMARY

OFFICE OF SAFETY & MISSION ASSURANCE
OFFICE OF THE CHIEF ENGINEER
OFFICE OF THE CHIEF TECHNOLOGIST

SAFETY, MISSION ASSURANCE, ENGINEERING
AND ADVANCED CONCEPTS

	FY 2000 OPLAN <u>REVISED</u>	FY 2001 OPLAN <u>REVISED</u>	FY 2002* PRES <u>BUDGET</u>
	(Thousands of Dollars)		
Safety and Mission Assurance	25,200	25,145	[28,700]
Engineering	13,100	17,462	[19,100]
Advanced Concepts	<u>4,700</u>	<u>4,789</u>	<u>--**</u>
Total.....	<u>43,000</u>	<u>47,396</u>	<u>[47,800]</u>

Distribution of Program Amount by Installation

Johnson Space Center	7,142	7,625	[8,645]
Kennedy Space Center	914	360	[550]
Marshall Space Flight Center	1,760	2,962	[3,700]
Stennis Space Center	80	150	[315]
Ames Flight Research Center.....	6,193	1,105	[1,245]
Dryden Research Center	334	300	[900]
Langley Research Center	5,124	5,925	[6,185]
Glenn Research Center	2,501	2,298	[2,035]
Goddard Space Flight Center.....	8,761	15,349	[12,690]
Jet Propulsion Laboratory	6,958	7,368	[7,705]
Headquarters.....	<u>3,233</u>	<u>3,954</u>	<u>[3,830]</u>
Total.....	<u>43,000</u>	<u>47,396</u>	<u>[47,800]</u>

**Beginning in FY 2002, SMA&E will be in the Human Space Flight Appropriation*

***Beginning in FY 2002, Advanced Concepts is funded in the SAT appropriation under Aerospace Technology*

PROGRAM GOALS

The Safety, Mission Assurance, Engineering, and Advanced Concepts (SMAEAC) area is an investment to enable the safety and success of all NASA programs. The SMAEAC budget supports the activities of the Office of Safety and Mission Assurance (OSMA), the Office of the Chief Engineer (OCE), and the former Office of the Chief Technologist (OCT). The OCT was merged with the Office of Aerospace Technology (OAT) in FY 2000, and OAT continues the former OCT's responsibilities. These Offices advise the Administrator, oversee NASA programs, develop Agency-wide policies and standards, and support the technology requirements of NASA flight programs. Each area is discussed separately.

SAFETY AND MISSION ASSURANCE

STRATEGY FOR ACHIEVING GOALS

The Safety and Mission Assurance (SMA) area assures that sound and robust SMA processes and tools are in place to enable safe and successful missions. This area establishes SMA strategies, policies, and standards, ensures that SMA disciplines are appropriately applied throughout the program life cycle. SMA also provides analysis, oversight, and independent assessment (IA) of programs, and flight and ground operations to ensure that suitable attention is placed on risk, missions are conducted safely, and there is a high probability of meeting Agency objectives. SMA funds research, development, pilot application, and evaluation of tools, techniques, and practices that advance NASA's SMA capabilities in areas such as facility and operational safety, risk management, human reliability, software assurance, and probabilistic risk analysis. Funding is also provided to develop SMA training courses.

ACCOMPLISHMENTS AND PLANS

In FY 2000, NASA achieved a lost time injury rate of 0.22 incidents per 200,000 workhours against a goal of 0.30. The FY 2001 goal is 0.28 lost time incidents per 200,000 workhours. Beginning in FY 2002, NASA uses the Federal Worker 2000 goal of remaining below 1.15 occupational illnesses or injuries per 100 workers.

The OSMA provided SMA support to, and independent review of, the International Space Station (ISS), Space Shuttle (4 missions), and science programs (including 6 expendable launch vehicle (ELV) payload launches) in FY 2000. Also in FY 2000, OSMA instituted an Independent Mission Assurance Review (IMAR) process for ELVs and payloads, similar to the preflight assurance review process for Space Station and Space Shuttle. Independent review of the ISS continues beyond FY 2002. Support and review will be provided to 7 Shuttle and 13 ELV and payload missions in FY 2001, and 7 Shuttle and 8 ELV and payload missions in FY 2002.

FY 2000 research, development, pilot application, and evaluation efforts for SMA tools, techniques and practices in disciplines such as operational and facility safety, risk management, quantitative risk analysis, software assurance, failure detection and prevention, parts assurance, and human reliability had the goal of enabling NASA safety and mission success. Revisions to the NASA Safety Manual; NASA Emergency Preparedness Plan Procedures and Guidelines; NASA Procedures and Guidelines for Mishap Reporting, Investigating, and Recordkeeping; and Government Safety and Mission Assurance Surveillance Functions for NASA Contracts were

completed. In FY 2001 and 2002, OSMA will continue to identify, develop, update, and evaluate SMA policies, processes, tools, techniques and practices (including risk management, operational safety, quantitative risk analysis, software assurance, failure detection and prevention, and human reliability) to enable safety and mission success

OSMA completed 3 Center Process Verification Reviews in FY 2000, with more Centers to be reviewed in FY 2001 and 2002. Activities to maintain NASA's third-party ISO 9001 certification continue beyond FY 2002. Safety reviews for Mars missions that will carry nuclear materials were begun in 2001, and reviews of other missions that will carry nuclear materials are anticipated.

ENGINEERING

STRATEGY FOR ACHIEVING GOALS

The OCE oversees the conduct and improvement of NASA's engineering practice, manages the strategic crosscutting process to "Provide Aerospace Products and Capabilities" and independently evaluates ongoing programs, proposed concepts, and options for new programs. The OCE establishes policies, standards, guidance, and support for improving NASA engineering practices and technical capabilities, and manages the NASA Electronics Parts and Packaging Program, which supports evaluation and infusion of advanced electronic parts and packaging technology into NASA programs.

ACCOMPLISHMENTS AND PLANS

In FY 2000, the NASA Integrated Action Team (NIAT) – an activity led by the Office of the Chief Engineer (OCE) -- developed a set of 17 recommendations for improving the overall NASA engineering and program management process. In FY 2001, the Office of the Chief Engineer (OCE) will begin development of an agency-wide systems engineering process that will be piloted and integrated with an updated program management structure in FY 2002. In FY 2000, NASA established policies to improve the software engineering process and provide a continuing basis for raising capability levels. Implementing procedures and metrics will be developed in FY 2001 and piloted in FY 2002.

The NASA Chief Engineer's Office is also undertaking an activity to more quantitatively define and characterize risk on different missions and projects. By linking discussion of acceptable risk to other mission and project variables including cost, schedule and performance, NASA intends to avoid taking on unnecessary risks during the development of critical, operational missions and projects while also avoiding unnecessary and potentially costly risk reduction measures on more experimental missions and projects. NASA intends to fully implement consideration of risk in the definition and development of new missions and projects starting in the FY 2003 budget. Eventually, NASA intends to incorporate consideration of risk at the program level by looking across multiple low- and high-risk projects to examine whether a program has the correct overall risk profile.

Two Independent Assessments of programs in development and 17 Independent Annual Reviews (IARs) of ongoing programs were conducted in FY 2000. Eight Independent Assessments, including several science missions, the ISS Propulsion Module, and Shuttle upgrade projects are anticipated in FY 2001. Both Independent Assessments and IARs will continue at the same level in FY 2002. In FY 2000, an integrated cost estimating capability was established to improve estimating tools and to provide independent cost estimates for specific programs. In FY 2001 independent estimates are planned for three programs and improved models will

be implemented; model development and independent estimates will continue in FY 2002. Systems Management Offices were established at each NASA Center to extend the independent evaluation function to the performing Center level.

In FY 2000, NASA completed identification of baseline voluntary consensus standards (VCS) for its NASA Preferred Technical Standards baseline and continues strong support for VCS development, implementing PL 104-113 and OMB A-119. On-line access to many of the adopted standards is available now and full access is planned for FY 2002. FY 2001 pilot initiatives will improve the use of standards include notifying using programs of standards updates and referencing lessons learned to relevant standards; these pilots will be extended NASA wide in FY 2002.

The NASA Electronic Parts and Packaging Program (NEPP) performs radiation testing, technology evaluation, and application readiness assessments of advanced electronics components and packaging technologies. In FY 2000, an integrated World Wide Web site was developed to make results of these evaluations available to users. Considerable emphasis is being placed on evaluation and infusing of "commercial off the shelf" technologies where they meet space reliability and performance requirements; guidance on use of new technologies was provided to several current programs in FY 2000. Continuing technology evaluations in FY 2001 will include advanced microprocessors, photonics, and extreme hi/low temperature behavior of components. In FY 2001, evaluations will include advanced sensor technologies, extremely low power devices, and high-density substrates.

ADVANCED CONCEPTS

STRATEGY FOR ACHIEVING GOALS

The Office of Aerospace Technology (OAT) is NASA's principal advocate for advanced technology. As such, the OAT advises the Administrator on technology matters and develops a NASA-wide investment strategy for innovative and advanced technology. The office leads the development of NASA-wide technology goals and objectives and oversees NASA technology policies, programs, processes, and capabilities. OAT also sponsors the NASA Institute for Advanced Concepts (NIAC), which addresses NASA strategic objectives requiring technology readiness ten to twenty years into the future. Funding for Advanced Concepts activities is recorded in the OAT budget beginning with FY 2002.

ACCOMPLISHMENTS AND PLANS

The NASA Institute for Advanced Concepts (NIAC) has completed the third full year of operation and all functions of the Institute have been fully implemented. During FY 2000 the NIAC awarded 6 Phase II contracts and 16 Phase I grants. Five additional Phase II awards have been made in FY 2001. Since the beginning of the contract, NIAC has awarded 46 Phase I grants and 16 Phase II contracts for a total value of \$8.6 million. These awards to universities, small businesses, small disadvantaged businesses and large businesses were for the development of revolutionary advanced concepts that may have a significant impact on NASA's future aeronautics and space missions. For example, the *Mini-Magnetospheric Plasma Propulsion (M2P2)* System, which uses the solar wind for propulsion, is receiving additional funding from NASA's Marshall Space Flight Center (MSFC) and funds have been allocated for follow-on tests and analysis for its space propulsion application. Moreover, it has the potential to provide shielding from cosmic ray radiation. A concept for *Very large optics for the Study of Extrasolar Terrestrial Planet* has collaboration with NASA's Goddard Space Flight Center (GSFC) and MSFC and is directly connected to long term space science goals to image planets around

other stars. A concept for a large *X-Ray Interferometry* has collaboration with GSFC and is directly connected with long term space science goals to study the structure and evolution of the universe. Other ongoing studies include using a constellation of steerable balloons for atmospheric studies and biologically inspired robotics. Also, during FY 2001 the next set of Phase I awards will be made and solicitations will be released for the next round of Phase I and Phase II awards.